



# WithersRavenel

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To: Plan Holders  
CC: City of Hendersonville  
From: Kevin Eason, P.E.  
Date: 11/6/21  
Project: Church and King Street Water & Sewer Improvements

## ADDENDUM 2

Bidders on this Project are hereby notified that this Addendum as all other Addenda shall be attached to and made a part of the above-named Bidding and Contract Documents.

The following items are issued to add to, modify, and/or clarify the Bidding and Contract Documents. These items shall have full force and effect as the Bidding and Contract Documents, and costs involved shall be included in the bid prices. Bids to be submitted on the specified bid date shall conform to the additions and revisions listed herein.

Acknowledge receipt of all Addenda by inserting the Addendum number and date in the appropriate location of the Bid Form. Failure to do so may subject the bidder to disqualification.

**The Bid Opening Date has changed and will now be held on November 10, 2021 @ 2 pm.**

**Bidders must replace the bid schedule found in the project manual with the revised bid schedule attached to Addendum 1.**

### Specification Modifications

03 30 00 – Cast-In-Place Concrete

### Answers to Contractor Questions

See attachment.

### Attachments

1. Answers to questions received since the pre-bid conference
2. Revised Section 03 30 00 – Cast-In-Place Concrete
3. Technical Data Sheet – MasterSeal 581

DocuSigned by:



DocuSigned by:

*Kevin Eason*

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11/6/2021

END OF ADDENDUM 2



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## City of Hendersonville

### *Church and King Streets Water and Sewer Improvements*

City Project Number: 19014 / WR Project Number: 08190726.00

The following questions regarding the project have been received and answers provided herein:

**Question 1.** Does the Owner have a location to dispose of debris? Landfill aren't permitted to take debris from sanitary sewer systems.

*[Reply] Contractor can assume to dump typical sanitary sewer debris at the Wastewater Treatment Facility at 99 Balfour Road, Hendersonville in coordination with City staff.*

**Question 2.** Can the Engineer please provide a table of the lines to be rehabbed via CIPP? Specifically for Sheets 06 and 07?

*[Reply] To avoid confusion prior to the upcoming bid, Contractors are directed to bid the project using the bid sheet issued in Addendum 1. The need for clarification on Sheets 06 and 07 has been noted. A revised set of plans will be provided to the successful low bidder.*

**Question 3.** The specification for Cementitious Exterior Surface Coating in Section 03 30 00 – Cast in Place Concrete, Page 11, Paragraph 2.03 I. shown below is incorrect. This cannot be bid by a subcontractor as it is written.

The product specified does not exist as it is currently named and described.

The "Thoroseal" product brand was discontinued. BASF Corporation no longer manufactures products of this type.

Consequently, there is no product reference standard for contractors to base their bid.

The acceptable equivalent and locally available product for your specified need manufactured by UGL is "DRYLOK Powdered Masonry Waterproofing".

I respectfully request you consider DRYLOK Powdered Masonry Waterproofing as an equivalent substitution and include in an upcoming Addendum.

*[Reply] Contractor is correct that Thoroseal has been discontinued. Specification 00 30 00 has been updated to specify Master Builders Solutions MasterSeal 581 for this use. DRYLOK Powdered Masonry Waterproofing is not approved for this product unless sufficient documentation can be produced to show it has similar properties (compressive strength, flexural strength, tensile strength, modulus of elasticity) to MasterSeal 581. Adequate documentation has not been provided to demonstrate this at this time and therefore DRYLOK Powdered Masonry Waterproofing is not considered an equivalent substitution at this time.*

SECTION 03 30 00  
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01. SUMMARY

A. Section Includes Cast-in-Place Concrete for Following Items:

1. Building frame members.
2. Beams, lintels, and columns.
3. Shear walls.
4. Retaining walls.
5. Foundation walls.
6. Footings.
7. Supported slabs.
8. Slabs on grade.
9. Control, expansion, and contraction joint devices.
10. Equipment pads.
11. Light pole base.
12. Flagpole base.
13. Thrust blocks.
14. Manholes.

1.02. REFERENCE STANDARDS

A. American Concrete Institute:

1. ACI 301 - Specifications for Structural Concrete.
2. ACI 302.1R – Guide to Concrete Floor and Slab Construction.
3. ACI 304R – Guide for Measuring, Mixing, Transporting, and Placing Concrete.
4. ACI 305R - Guide to Hot Weather Concreting.
5. ACI 306.1 - Standard Specification for Cold Weather Concreting.
6. ACI 309 – Consolidation of Concrete.
7. ACI 318 - Building Code Requirements for Structural Concrete.

B. ASTM International:

1. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
2. ASTM C33 - Standard Specification for Concrete Aggregates.

3. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
4. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
5. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
6. ASTM C109 – Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
7. ASTM C143 - Standard Test Method for Slump of Hydraulic-Cement Concrete.
8. ASTM C150 - Standard Specification for Portland Cement.
9. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
10. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
11. ASTM C219 – Standard Terminology Relating to Hydraulic Cement.
12. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
13. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
14. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.
15. ASTM C430 – Standard Test Method for Fineness of Hydraulic Cement by the 45- $\mu$ m (No. 325) Sieve.
16. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
17. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
18. ASTM C881 – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
19. ASTM C1017 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
20. ASTM C1064 - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
21. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
22. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete.
23. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.
24. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
25. ASTM E154 – Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

26. ASTM E329 – Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
27. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
28. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

C. State of North Carolina Department of Transportation

1. Standard Specifications for Roads and Structures, latest revision

1.03. COORDINATION

- A. Section 01 20 00 – Project Meetings.
- B. Schedule delivery of trucks in order to prevent delay of placing after mixing.
- C. Coordinate placement of waterstops with erection of concrete formwork and placement of form accessories.

1.04. SUBMITTALS

- A. Section 01 03 00 – Submittals/Electronic Submittals.
- B. Product Data: Submit data on attachment accessories, admixtures, dry shake finish materials, and others as requested by ENGINEER.
- C. Design Data:
  1. Submit concrete mix design for each concrete strength.
    - a. Strength data for establishing standard deviation and required overstrength factor will be considered suitable if the concrete production facility has certified records consisting of at least 30 consecutive tests in one group or the statistical average for two groups totaling 30 or more tests representing similar materials and project conditions. Records of these tests shall be submitted with the proposed design mix.
    - b. If standard deviation exceeds 800 psi or if no suitable records are available, select proportions to produce an average strength of at least 1200 psi greater than the required compressive strength of concrete. If standard deviations are less than 600 psi, the minimum overstrength factor required in the design mix shall be in accordance with ACI 318.
  2. Submit separate mix designs if admixtures are required for following:
    - a. Hot and cold weather concrete Work.
    - b. Air entrained concrete Work.
- D. Identify mix ingredients and proportions, including admixtures.
  1. Identify chloride content of admixtures and whether or not chlorides were added during manufacture.
  2. Identify amounts of mixing water to be withheld for later addition at Project site.

- E. Submit chemical and physical analysis of all cement and fly ash delivered to the batch plant seven (7) days prior to use of the cement or fly ash.
  - F. Submit a copy of mill test reports on all cement delivered to the job 7 days prior to use of the cement. Cube strength from mill tests shall have a tolerance of  $\pm 600$  psi.
  - G. Materials Certificates
    - 1. Provide materials certificates in lieu of materials laboratory test reports when permitted by ENGINEER.
    - 2. Manufacturer and CONTRACTOR, certifying that each material item complies with, or exceeds, specified requirements, shall sign materials certificates for the following:
      - a. Cementitious materials.
      - b. Admixtures.
      - c. Fiber reinforcement.
      - d. Floor and slab treatments.
      - e. Bonding agents.
      - f. Adhesives.
      - g. Semirigid joint filler.
      - h. Joint-filler strips.
      - i. Repair materials.
  - H. Qualification Data: For Installer and Manufacturer.
  - I. Manufacturer Instructions: Submit installation procedures and interfacing required with adjacent Work.
  - J. Field Quality-Control Submittals: Indicate results of CONTRACTOR-furnished tests and inspections.
- 1.05. CLOSEOUT SUBMITTALS
- A. Section 01 72 00 – Project Record Documents.
  - B. Batch Tickets: For each load of concrete, provide the following information:
    - 1. Design mix designation
    - 2. Exact time cement, water and aggregate were discharged into the mix
    - 3. Compressive strength of mix
    - 4. Amount of water added to the mix
  - C. Submit records each month of all concrete pours showing exact location of pour, date of pour, quantity of pour, temperature at time of pour, and class of concrete.
  - D. Project Record Documents: Record actual locations of embedded utilities and components concealed from view in finished construction.
- 1.06. QUALITY ASSURANCE
- A. Do not begin concrete production until mixes have been approved by the ENGINEER.

1. Perform Work according to ACI 301 and ACI 318.
- B. Comply with ACI 305R when pouring concrete during hot weather.
  1. When the ambient air temperature is above 75 degrees F, an approved admixture designed to retard the rate of set shall be used for all concrete placed
  2. The temperature of the concrete as placed shall not exceed 90°F. The mixing water and/or aggregates shall be cooled, if necessary, to maintain a satisfactory placing temperature. Fresh concrete with temperatures 90 degrees F. or above shall be discarded off site.
  3. Cool reinforcing by wetting sufficiently so that steel temperatures will be nearly equal to the ambient air temperature.
  4. Provide wind breaks around the perimeter of the area where concrete is being placed.
  5. The amount of cement used in the job is computed for the temperature indicated on the approved design mix. Increase the weight of the cement at the rate of 12 lbs. per cubic yard for each 10 degrees F. above the concrete mix temperature.
- C. Comply with ACI 306.1 when pouring concrete during cold weather (temperatures 40 degrees F. or below during placement or temperatures 40 degrees F. or below within five (5) days after the concrete is placed).
  1. Do not use frozen materials or materials containing ice or snow.
  2. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  3. Do not use calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.
- D. Acquire cement and aggregate from one source for Work, and obtain admixtures from single source from single manufacturer.
- E. Where applicable, perform Work according to North Carolina Department of Transportation standards and the more stringent requirements specified herein.

#### 1.07. QUALIFICATIONS

- A. Installer: Employ on-Project personnel qualified as ACI-certified Flatwork Technician and Flatwork Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer: Experienced in manufacturing ready-mixed concrete products and complying with ASTM C94 requirements for production facilities and equipment.
  1. Certified according to NRMCA's "Certification of Production Facilities."

#### 1.08. AMBIENT CONDITIONS

- A. Maintain concrete temperature after installation at minimum 50 degrees F for minimum seven days.
- B. Maintain high-early strength concrete temperature after installation at minimum 50 degrees F for minimum three days.

### PART 2 PRODUCTS

#### 2.01. MATERIALS

A. Concrete:

1. Cement:
  - a. Type: Portland.
  - b. Color: white.
  - c. Fineness: no more than 10 percent retained on a No. 325 mesh screen when tested in accordance with ASTM C430.
2. Comply with ASTM C150, Type I - Normal or Type II - Moderate Sulfate Resistant.
3. Normal Weight Aggregates:
4. Comply with ASTM C33.
5. Coarse Aggregate Maximum Size: According to ACI 318.
  - a. Aggregate shall consist of clean crushed stone or gravel having hard, strong, uncoated particles free from injurious amounts of soft, thin, elongated or laminated pieces, alkali, organic or other deleterious matter.
  - b. The maximum permissible percentage of elongated particles is 5 percent by weight. Elongated particles are those defined as having a length equal to or greater than 5 times the width.
  - c. The fineness modulus of the coarse aggregate shall not vary more than  $\pm 0.3$  percent.
  - d. Fine Aggregate shall consist of sand, stone screening, or other inert materials with similar characteristics having clean, strong, durable, uncoated grains and free from lumps, soft or flaky particles, clay, shale, alkali, organic matter, or other deleterious substances with reactivity to alkali in cement.
6. Lightweight Aggregate:
7. Comply with ASTM C330.
8. Coarse Aggregate Maximum Size: According to ACI 318.
9. Water:
10. Comply with ACI 318.
  - a. Potable.

B. Admixtures:

1. Do not use admixtures which have not been incorporated and tested in the accepted mixes unless otherwise authorized in writing by the ENGINEER.
2. Use admixtures in strict accordance with the manufacturer's written instructions. Proportion design mix using the proposed admixtures at optimum recommended dosages.
3. Air Entrainment: Comply with ASTM C260.
4. Chemical: Comply with ASTM C494.



- a. Provide admixtures certified by manufacturer to be compatible with other admixtures and containing not more than 0.1 percent chloride ions.
  - b. Type A - Water Reducing.
  - c. Type D - Water Reducing and Retarding.
  - d. Type E - Water Reducing and Accelerating.
  - e. Type F - Water Reducing, High Range.
  - f. Type G - Water Reducing, High Range, and Retarding.
- 5. Fly Ash: Comply with ASTM C618, Class C or Class F.
  - a. Loss of ignition shall be less than 3 percent, and all fly ash shall be a classified processed material.
- 6. Silica Fume: Comply with ASTM C1240.
- 7. Plasticizing:
- 8. Comply with ASTM C1017.
  - a. Type II, plasticizing and retarding.
- 9. Prohibited Admixtures: Calcium chloride thyocyanates or admixtures containing more than 0.1 percent chloride ions.
- C. Joint Devices and Filler:
  - 1. Joint Filler:
    - a. Description: Asphalt-impregnated fiberboard or felt.
    - b. Comply with ASTM D1751.
    - c. Profile: Tongue-and-groove.
  - 2. Sealant and Primer: two-part mineral filled epoxy polyurethane.

## 2.02. CONCRETE MIX

- 1. Select proportions for normal weight concrete according to ACI 301, Method 1 or Method 2.
  - 2. If Method 1 is used, use an independent testing facility acceptable to ENGINEER for preparing and reporting proposed mix designs.
  - 3. Submit written reports to ENGINEER of each proposed mix for each class of concrete at least 25 days prior to start of work.
  - 4. Do not begin concrete production until mixes have been reviewed by ENGINEER.
- B. Performance and Design Criteria:
  - 1. Compressive Strength: 3500 psi at 28 days.
  - 2. Cement Type: ASTM C150.
  - 3. Aggregate Type:
    - a. Unless otherwise specified all aggregate shall be normal weight aggregate.

4. If the average strength of the laboratory control cylinders shows the concrete to be below the specified design strength, the aggregate proportions and water content may be changed by the ENGINEER, who, in addition to such changes, may require core tests.
5. Maximum Water-Cement Ratio:
  - a. Concrete used in sanitary structures and floor slabs: 0.45.
  - b. Air-entrained concrete exposed to freezing and thawing: 0.53.
  - c. Do not add water at the site without permission from the ENGINEER's Field Representative.
    - 1) Do not add water to concrete after adding high-range water-reducing (HRWR) admixtures to mixture.
  - d. Any water which is added shall be recorded on the Delivery Ticket and Test Report.
6. Air Content:
  - a. Concrete structures and slabs exposed to freezing and thawing, deicer chemicals, or subjected to hydraulic pressure shall have the following air content depending on aggregate used:
    - 1) No. 467 aggregate (1½"): 5.5 ± 1 percent
    - 2) No. 57 (1") or No. 67 (¾"): 6.0 ± 1 percent
  - b. Other Concrete (not exposed to freezing, thawing, or hydraulic pressure)
    - 1) 2.0-4.0%
7. Maximum Fly Ash Content: 10 to 20 percent of cementitious materials by weight.
8. Maximum Slag Content: 25-50 percent of cementitious materials by weight.
9. Slump: 2-4 inches before the addition of an HRWR.
  - a. Addition of water at the site for concrete mix with insufficient slumps (slumps less than the maximum specified herein) will not be permitted. Concrete delivered to the project with slump less than the minimum or greater than the maximum specified shall be rejected and discarded off site.
  - b. A tolerance of up to, but not exceeding, 1 inch above the indicated maximum shall be allowed for individual batches in any one day's pour provided the average of the most recent ten batches within the same pour does not exceed the maximum limits. No tolerance will be permitted for individual batches when less than ten (10) batches are delivered for one day's pour.
10. Adjustment to Concrete Mixes
  - a. Mix design adjustments may be requested when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, at no additional cost to OWNER and as accepted by ENGINEER.
  - b. Submit laboratory test data for revised mix design and strength results and get approval by the ENGINEER before using in work.

11. Cold Weather:
  - a. Use accelerating admixtures in cold weather.
  - b. Use of admixtures will not relax cold-weather placement requirements.
12. Hot Weather: Use set-retarding admixtures.
13. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators or admixtures containing calcium chloride unless otherwise specified and approved in mixture designs.
14. Add air entrainment admixture to concrete mix for Work exposed to freezing and thawing, hydraulic pressure, or deicing chemicals.
15. For concrete exposed to deicing chemicals, limit fly ash, pozzolans, silica fumes, and slag content as required by applicable code.
16. Use a water reducing admixture or HRWR in concrete as required for placement and workability.
17. An HRWR is required for all concrete in walls and for other concrete which is pumped.
  - a. It is optional for other concrete which is not pumped.
18. Average Compressive Strength Reduction: Permitted according to ACI 318.
19. Ready-Mixed Concrete: Mix and deliver concrete according to ASTM C94.
20. For concrete structures greater than 3 feet in thickness, the temperature of the mix shall be controlled by approved methods to a temperature not greater than 70°F at the time of placement.
21. During hot weather or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 will be required as follows:
  - a. When air temperatures are between 80 degrees F. and 90 degrees F., reduce the mixing and delivery time from 1-1/2 hours to 1 hour
  - b. When outside air temperatures are above 90 degrees F, reduce the mixing and delivery time from 1-1/2 hours to 45 minutes.
22. Site-Mixed Concrete: Mix concrete according to ACI 318.

## 2.03. ACCESSORIES

### A. Bonding Agent:

1. Description: Polyvinyl acetate, Latex emulsion.
2. Subject to compliance with requirements, provide product equal to one of the following:
  - a. Polyvinyl Acetate (Interior Only)
    - 1) "Weld-Crete;" Larsen Products Corp.
  - b. Latex Emulsion
    - 1) "Bonding Agent J40;" Dayton Superior Corp
    - 2) "L&M Everbond;" Laticrete

- 3) "Acrylic Bondcrete;" The Burke Co
- 4) "SBR Latex;" Euclid Chemical Co
- 5) "Daraweld C;" W.R. Grace & Co.

B. Epoxy Adhesive

1. ASTM C881, two component materials suitable for use on dry or damp surfaces
2. Provide material "Type", "Grade", and "Class" to suit project requirements.
3. Products
  - a. Subject to compliance with requirements, provide product equal to one of the following:
    - 1) "Thiopoxy;" W.R. Grace & Co.
    - 2) "Sikadur-32 Hi Mod;" Sika Corporation
    - 3) "Euco Epoxy 452;" Euclid Chemical Co

C. Vapor Retarder:

1. Description: Clear polyethylene film.
2. Comply with ASTM E1745, Class C, or ASTM E154.
3. Thickness: 6 mils.
4. Type: As recommended for below-grade application.
5. Joint Tape: As recommended by manufacturer.

D. Non-shrink Grout:

1. Description: Premixed compound consisting of non-metallic aggregate, cement, and water-reducing and plasticizing agents.
2. Comply with ASTM C1107.
3. Minimum Compressive Strength: 2,400 psi in 48 hours and 7,000 psi in 28 days.

E. Concrete Repair Grout

1. For the repair of defective areas of concrete
2. For vertical and overhead surfaces, use one of the following or an approved equal:
  - a. "Five Star Structural Concrete V/O;" Five Star Products, Inc
  - b. "Verticoat;" Euclid Chemical Co
  - c. "Sikatop 122-PLUS;" Sika Corporation
3. For horizontal surfaces, use one of the following or an approved equal:
  - a. "Five Star Structural Concrete;" Five Star Products, Inc
  - b. "Sikatop 122-PLUS;" Sika Corporation

F. Concrete Reinforcing Fibers:

1. Description: High-strength industrial-grade fibers specifically engineered for secondary reinforcement of concrete.
  2. Comply with ASTM C1116.
  3. Tensile Strength: 130 ksi.
  4. Toughness: 15 ksi.
  5. Fiber Length: 3/4 inch.
  6. Fiber Count: 34 million/lb.
- G. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
1. Cement Binder: ASTM C150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C219.
  2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
  3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
  4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C109.
- H. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
1. Cement Binder: ASTM C150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C219.
  2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
  3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
  4. Compressive Strength: Not less than 5,000 psi at 28 days when tested according to ASTM C109.
- I. Surface Coating for all exposed concrete except where otherwise shown shall be "Master Builders Solutions MasterSeal 581" or an approved equal.

### PART 3 EXECUTION

#### 3.01. EXAMINATION

- A. Verify requirements for concrete cover over reinforcement.
- B. Verify that anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

#### 3.02. PREPARATION

- A. Removal of Existing Concrete:

1. See Drawings for locations of existing walls and slabs to be removed.
  2. See Drawings for dowels and other requirements which may not be stated below.
  3. Where new concrete is to be placed against the cut surface of an existing wall or slab, the wall or slab may be saw cut clear through or it may be saw cut 1" deep (minimum) on exposed surfaces and the remainder chipped away.
  4. If chipping is done, take precautions not to damage the existing concrete which is to remain.
  5. Where the cut surface of the wall or slab is to be exposed to water or earth but not exposed to view, saw cut the wall or slab clear through.
  6. At all exposed rebars, chip out the concrete around the rebar for a distance of 2" and to a depth of ¼".
  7. Apply concrete repair grout to the chipped-out area with a trowel to obtain a ½" cover over the rebar.
  8. Where the cut surface of the wall or slab is to be exposed-to-view, roughen the entire cut surface to obtain a 1/8" amplitude.
  9. Apply concrete repair grout to forms to achieve a smooth surface with at least 1" thickness.
- B. Previously Placed Concrete:
1. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent.
  2. Remove laitance, coatings, and unsound materials.
- C. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels, and pack solid with non-shrink grout.
- D. Remove mud, oil, debris, ice, or other materials that may adversely affect or reduce the bond from formwork, reinforcement, and concrete substrates.
- E. Remove water from areas receiving concrete before concrete is placed.
- F. Apply temporary protective covering to lower 2' of finished walls adjacent to poured floor slabs and similar conditions, and guard against spattering during placement.
- G. Preparation of Subgrade for Slabs on Grade:
1. The subgrade shall be well drained and of adequate and uniform loadbearing nature. The in-place density of the subgrade soils shall be at least the minimum required in the specifications. The bottom of an undrained granular base course shall not be lower than the adjacent finished grade.
  2. The subgrade shall be free of frost before concrete placing begins.
  3. If the temperature inside a building where concrete is to be placed is below freezing, raise the temperature and maintain it above 50 degrees F. long enough to remove all frost from the subgrade.

4. The subgrade shall be moist at the time of concreting. If necessary, dampen it with water in advance of concreting. Do not allow free water standing on the subgrade nor any muddy or soft spots when the concrete is placed.

### 3.03. INSTALLATION

#### A. Placing Concrete:

1. Soil bottoms at foundation systems are subject to testing laboratory as directed by the ENGINEER. Place concrete immediately after approval of foundation excavations.
2. Place Crushed Stone Fill, 6 inches in depth, under all concrete floors in contact with the ground. Compact stone as thoroughly as possible by tamping and rolling.
3. Moisten wood forms immediately before placing concrete where form coatings are not used.
4. Place concrete according to ACI 304. Handle concrete from the mixer to the place of final deposit as rapidly as practical by methods which will prevent separation or loss of ingredients and in a manner which will assure that the required quality concrete is obtained.
  - a. Concrete placed by pumping shall conform to the recommendations of ACI 304.2R.
5. Notify testing laboratory and ENGINEER minimum 24 hours prior to commencement of operations.
6. Deposit concrete at final position, preventing segregation of mix.
7. Place concrete for each panel continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness or section as determined by predetermined construction joints.
8. Place concrete continuously between predetermined expansion, control, and construction joints.
9. Do not interrupt successive placement and place each layer while preceding layer is still plastic to avoid cold joints.
10. Consolidate concrete by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  - a. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.
  - b. Do not use vibrators to transport concrete inside forms.
  - c. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine.
  - d. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer.
  - e. Do not insert vibrators into lower layers of concrete that have begun to set.

- f. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.
11. Ensure that reinforcement, inserts, embedded parts, formed expansion and contraction joints are not disturbed during concrete placement.
  - a. Do not drop concrete a vertical distance greater than five feet.
  - b. To place concrete lifts greater than five feet, use a hose, drop chute, or other approved method.
12. Install vapor retarder under interior slabs on grade according to ASTM E1643. Place vapor retarder sheeting with longest dimension parallel with direction of pour.
13. Lap joints minimum 6 inches and seal watertight by taping edges and ends.
14. Repairs:
  - a. Repair vapor retarder damaged during placement of concrete reinforcement.
15. Using vapor retarder material, lap over damaged areas minimum 6 inches and seal watertight.
16. Place floor slabs in indicated checkerboard or saw-cut pattern.
  - a. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  - b. Bring slab surfaces to correct level with straightedge and strike off.
  - c. Use bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows.
  - d. Do not sprinkle water on the plastic surface. Do not further disturb slab surfaces before starting finishing operations.
17. Maintain accurate records of concrete placement, including:
  - a. Date of pour
  - b. Area poured
  - c. Temperature at time of pour
  - d. Location
  - e. Quantity
  - f. Average air temperature during curing period
  - g. Date forms scheduled for removal
  - h. Date form removal completed
  - i. Test samples taken and test cylinder serial numbers
  - j. Strength of test cylinders at 7 and 28 days.
  - k. Method of reshoring (number of floor, etc.)
18. Joints:



- a. Locate joints in slabs on grade to divide the slab in areas not in excess of 800 sq. ft.
- b. The maximum distance between joints in slabs on grade at all points of contact between slabs on grade and vertical surfaces such as foundation walls and elsewhere shall be as indicated.
- c. All exposed joints in the slabs on grade shall have the edges tooled and the crack and groove formed by the edging tool filled with a polyurethane joint sealant. No Form-A-Key or similar metal form joints will be permitted.
- d. At exposed construction joints, recess the premolded fill on a minimum of ½-inch, and fill the remaining section with a joint seal and as specified herein.

19. Isolation Joints in Slabs on Ground

- a. Construct isolation joints with ½-inch expansion joint material in slabs on ground at points of contact between slabs on ground and vertical surfaces, such as column pedestals, foundation walls, grade beams, and elsewhere as indicated.
- b. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

20. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

21. Joint Filler:

- a. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.
- b. Prepare, clean, and install joint filler according to manufacturer's written instructions.
- c. Use joint sealant for all exposed joints in exterior paving slabs, sidewalks, where concrete slabs abut concrete walls, and in exposed joints in slabs on grade.
- d. Separate slabs on grade from vertical surfaces with joint filler.
- e. Place joint filler in floor slab pattern placement sequence; set top to required elevations; secure to resist movement by wet concrete.
  - 1) Install joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.
  - 2) Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants are indicated.
- f. All exposed construction joints in the slabs on grade shall have the edges tooled and the crack and groove formed by the edging tool filled with a polyurethane joint sealant.

22. Saw-Cut Joints:

- a. Saw-cut joints within 12 hours after placing.

23. Use 3/16 inch thick blade.

- a. Cut into 1/4 depth of slab thickness.

24. Screeding:

- a. Screed floors, slabs on grade, and concrete which is to receive other construction level to avoid excessive skimming or grouting.
- b. Surface Flatness: FF 20.
- c. Screed slab surfaces with a straightedge and strike off to correct elevations.

B. Concrete Finishing:

1. Provide formed concrete surfaces to be concealed or not-exposed-to-view in the finished work with a standard rough form finish.
  - a. **NOTE:** Interior faces of walls of water retaining structures are not considered to be concealed.
  - b. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding ¼ inch in height rubbed down or chipped off.
2. Provide formed concrete and other areas as indicated on Drawings with smooth form finish.
  - a. Also used on formed concrete surfaces that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or other similar system.
  - b. Immediately after forms are removed, repair and patch defective areas with fins or other projections, and fill all pinholes and other voids larger than ¼ inch with a cement grout.
  - c. Compress mortar into voids with a firm rubber trowel or float.
  - d. After mortar dries, wipe off surface with burlap.
3. Provide formed concrete surfaces to be exposed-to-view with smooth-rubbed finish.
  - a. This would include exposed wall surfaces extending to one foot below grade or one foot below the water line.
  - b. Use smooth, high quality forms.
  - c. Chip away all high spots.
  - d. Within 72 hours after forms are removed, fill all air bubbles and small holes with a sand-cement-bonding agent grout proportional to match the wall finish.
  - e. Rub the entire surface of wall with a fine abrasive stone to create a smooth surface, free of all form marks and holes.
  - f. Do not finish wall by leaving a thin "plastered" layer of grout.
  - g. For repair of defective areas with holes deeper than ½ inch, see "Concrete Surface Repairs" contained herein.

4. Finish concrete floor surfaces according to ACI 302.1R.
5. Wood float surfaces receiving a trowel finish, membrane or elastic waterproofing, membrane or elastic roofing, or terrazzo with full-bed setting system.
  - a. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating.
  - b. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power driven floats, or both.
  - c. Consolidate surface with power driven floats, or by hand floating if area is small or inaccessible to power units.
  - d. Check and level surface plane to tolerances of FF 20 FL 15. Cut down high spots and fill low spots.
  - e. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, sandy texture.
6. Steel trowel surfaces receiving carpeting, resilient flooring, seamless flooring, thin-set quarry tile, thin-set ceramic tile, and other thin film finish coatings.
  - a. After floating, begin first trowel finish operation using a power driven trowel.
  - b. Begin final troweling when surface produces a ringing sound as trowel is moved over surface.
  - c. Consolidate concrete surface by final hand troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to tolerances of FF 20 FL 17. Grind smooth surface defects which would telegraph through applied floor covering system.
  - d. At all interior ramps, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.
7. Steel trowel surfaces indicated to be exposed.
8. Apply non-slip broom finish to exterior concrete platforms, parking surfaces, exterior concrete walks, steps, ramps, walkways, tank slabs, channel slabs, and elsewhere as indicated.
  - a. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route or drawing burlap belt across the surface.
9. Apply scratch finish to slab surfaces to receive a grout overlay or other bonded surface finishes.
  - a. After the concrete has been placed, consolidated, struck off, and leveled to a Class C tolerance, the surface shall be roughened with stiff brushes or rakes before a final set (within two hours after placing to insure a permanent bond between base slab and applied cementitious materials).
10. In areas with floor drains, maintain floor elevation at walls and pitch surfaces uniformly to drains as indicated on Drawings.

11. At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike off smooth and finish with a texture matching the adjacent formed surfaces. Continue the final surface treatment of formed surfaces uniformly across the adjacent unformed surface unless otherwise shown.

C. Miscellaneous Concrete Items

1. Curbs:

- a. Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

2. Filling In:

- a. Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated.
  - b. Mix, place, and cure concrete, as specified, to blend with in-place construction.
  - c. Provide other miscellaneous concrete filling indicated or required to complete the Work.

3. Equipment Bases and Foundations:

- a. Provide machine and equipment bases and foundations as shown on Drawings.
  - b. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.
  - c. Grout base plates and foundations as indicated, using specified non shrink grout.
  - d. Use non-metallic grout for exposed conditions, unless otherwise indicated.

4. Steel Pan Stairs:

- a. Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

D. Curing and Protection:

1. Cure concrete floor surfaces as specified.

3.04. FIELD QUALITY CONTROL

- A. Testing and Inspecting: ENGINEER may require testing of cast-in-place concrete.
- B. A testing laboratory approved by the ENGINEER will be employed by the CONTRACTOR and paid by the CONTRACTOR. If included in the PROJECT BID SCHEDULE these costs shall be reimbursable from the Bid Allowance line item established for testing; otherwise these costs should be included in the price of the work to be completed.
- C. The CONTRACTOR shall employ a concrete testing laboratory to provide all laboratory testing services on the project and a concrete technician to perform all quality control tests on concrete and materials used to batch concrete. The testing agency shall meet the requirement of ASTM E329. Testing and inspecting shall be performed by CONTRACTOR's testing laboratory according to ACI 318.

- D. Such tests will be provided and paid for by the OWNER, except that tests which reveal non-conformance with the Specifications and all succeeding tests for the same area, until conformance with the Specifications is established shall be at the expense of the CONTRACTOR. The OWNER will be responsible for paying for only the successful tests.
- E. Provide and maintain adequate facilities on the project for the testing laboratory to locate the required testing equipment and for safe storage area for test cylinders. Provide all casual labor needed to assist the concrete technician in obtaining samples of concrete and concrete materials and moving and transporting cylinders and materials which are being tested.
- F. Concrete Inspections:
  - 1. Continuous Placement Inspection: Inspect for proper installation procedures.
  - 2. Periodic Curing Inspection: Inspect for specified curing temperature and procedures.
- G. Strength Test Samples:
  - 1. Sampling Procedures: Comply with ASTM C172.
    - a. Each sample shall be obtained from a different batch of concrete on a random basis, avoiding any selection of the test batch other than by a number selected at random before commencement of concrete placement.
  - 2. Cylinder Molding and Curing Procedures:
  - 3. Comply with ASTM C31.
    - a. Cylinder Specimens: Standard cured, except when field cured specimens are requested by ENGINEER.
  - 4. Sample concrete and make one set of four cylinders for every 50 cu. yd. or less of each class of concrete placed each day, and for every 5,000 sq. ft. of surface area for slabs and walls.
  - 5. If volume of concrete for a class of concrete would provide less than five sets of cylinders, take samples from five randomly selected batches, or from every batch if less than five batches are used.
  - 6. Make one additional cylinder during cold weather concreting and field cure.
  - 7. When the total quantity of concrete with a given mix design is less than 50 cu. yd., the strength test may be waived by the ENGINEER if, in his judgment, adequate evidence of satisfactory strength is provided, such as strength test results for the same kind of concrete supplied on the same day and under comparable conditions to other work or other projects.
- H. Field Testing:
  - 1. Slump Test Method: Comply with ASTM C143
    - a. One test at point of truck discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
  - 2. Air Content Test Method: Comply with ASTM C173 or ASTM C231.
    - a. One test for each day's pour of each type of air entrained concrete.

3. Temperature Test Method: Comply with ASTM C1064.
  - a. Test hourly when air temperature is 40°F and below, and when 80°F and above; and each time a set of compression test specimens made.
4. Compressive Strength Concrete:
  - a. Measure slump and temperature for each sample.
  - b. Measure air content in air-entrained concrete for each sample.
  - c. Determine unit weight of concrete sample for each strength test.
- I. Cylinder Compressive Strength Testing:
  1. Test Method: Comply with ASTM C39.
  2. Test Acceptance: According to ACI 318.
    - a. Compressive strength tests for laboratory-cured cylinders will be considered satisfactory if the averages of all sets of three consecutive compressive strength test results equal or exceed the 28-day design compressive strength of the type of class of concrete; and, no individual strength test falls below the required compressive strength by more than 500 psi.
    - b. If compressive strength tests fail to meet these requirements, the concrete represented by these tests will be considered deficient and subject to additional testing, including, but not limited to core testing, and/or removal at the CONTRACTOR's expense.
  3. Test one cylinder at seven days.
  4. Test two cylinders at 28 days.
    - a. The test result shall be the average of the strengths of the two specimens tested at 28 days.
    - b. If one specimen in a test manifests evidence of improper sampling, molding, or testing, it shall be discarded and the strength of the remaining cylinder shall be considered the test result.
    - c. Should both specimens in the test show any of the above defects, the entire test shall be discarded.
  5. Retain one cylinder for later testing when requested by ENGINEER.
  6. Dispose of remaining cylinders if testing is not required.
- J. Core Compressive Strength Testing:
  1. The testing laboratory may make additional tests of in place concrete when compressive strength test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by ENGINEER.
  2. Sampling and Testing Procedures: Comply with ASTM C42.
  3. Test Acceptance: According to ACI 318 .
  4. Drill three cores for each failed strength test from failed concrete.

5. CONTRACTOR shall pay for such tests when unacceptable concrete is verified.

K. Concrete Surface Repairs:

1. Allow ENGINEER to inspect concrete surfaces immediately upon removal of forms.
2. Honeycombing or Embedded Debris in Concrete:
  - a. Not acceptable.
  - b. Notify ENGINEER upon discovery.
3. Patch imperfections as directed by ENGINEER.
  - a. Cut out honeycombs, rock pockets, voids over ½ inch in diameter and holes left by tie rods and bolts down to solid concrete, but in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surfaces. Expose reinforcing steel with at least ¾ inch clearance all around.
  - b. Dampen all concrete surfaces in contact with patching concrete, and brush with a neat cement grout coating or concrete bonding agent. Place patching concrete before grout takes its initial set. Mix patching concrete of the same materials to provide concrete of the same type or class as the original adjacent concrete. Place, compact, and finish as required to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.
  - c. Fill holes extending through concrete by means of a plunger type gun or other suitable device from the least exposed face to insure complete filling.
  - d. Remove stains and other discolorations that cannot be removed by cleaning for all exposed surfaces.
  - e. Repair isolated random cracks and single holes not over 1 inch in diameter by the dry-pack method. Groove the top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen all cleaned concrete surfaces and brush with a neat cement grout coating. Place dry-pack, consisting of 1 part Portland cement to 2-1/2 parts fine aggregate passing a no. 16 mesh sieve using only enough water as required for handling and placing. Compact dry-pack mixture in place and finish to match the existing surface.
  - f. Fill in holes and openings left in concrete structures for the passage of work by other trades, unless otherwise shown or directed, after the work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide all other miscellaneous concrete filling shown or required to complete work.
  - g. At defective areas exposed-to-view, the ENGINEER may substitute a sand-cement grout applied with a bonding agent to more closely match the color of the wall.
  - h. Correct high areas in unformed surfaces by grinding, after the concrete has cured at least 14 days. Correct low areas in unformed surfaces during, or immediately after, completion of surface finishing operations by cutting out the low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to the ENGINEER.

L. Defective Concrete:

1. Description: Concrete that fails to reach the required design compressive strength after 28 days as evidenced by the compressive strength test or concrete not conforming to required lines, details, dimensions, tolerances, or specified requirements.
2. Do not patch, fill, touch up, repair, or replace exposed concrete except upon express direction of ENGINEER for each individual area.
3. Defective concrete shall be corrected as directed at the CONTRACTORs expense, without extension of time therefore. The CONTRACTOR shall also be responsible for the cost of corrections to any other work affected by or resulting from correction to the concrete work.

M. All concrete structures which will retain water or wastewater under normal operating conditions shall be filled with water prior to backfilling and final exterior painting and tested for leaks. Unless otherwise specified by the ENGINEER, the tank shall remain filled with water for a period of seven (7) days. Any leaks, damp spots, or other defects found shall be repaired and made water tight to the satisfaction of the ENGINEER. The first 48 hours of the test are utilized to allow the concrete to absorb water. After the first 48 hours of the test, the water level shall be noted and monitored for the remaining five (5) days. A reduction in water greater than 0.1 percent per 24 hours shall be considered excessive and shall constitute failure of the leak test. (NOTE: Rainfall and evaporation must be considered during calculation of water loss. Rainfall shall be added to and evaporation shall be deducted from the measured loss to determine net liquid loss.)

END OF SECTION



## MasterSeal® 581

Air Barrier and Waterproof cement-based coating  
 for concrete and masonry

FORMERLY THOROSEAL®

### PACKAGING

MasterSeal 581:

- 50 lb (22.7 kg) polyethylene-lined bags for MasterSeal 581 white, standard gray, all landscape colors and custom colors
- 50 lb (22.7 kg) pails for MasterSeal 581 white and standard gray

MasterEmaco A 660:

- 1 qt (0.9 L) bottles (8 qt per carton)
- 1 gal (3.8 L) bottles (4 gal per carton)
- 5 gal (18.9 L) pails
- 55 gal (208 L) drums

### YIELD

- 225 ft²/50 lb (20.9 m²/22.7 kg) bag as a base coat at 1/16" (1.6 mm) dry-film thickness.
  - 450 ft²/50 lb (41.8 m²/22.7 kg) bag as a topcoat at 1/32" (0.8 mm) dry-film thickness.
- Coverage will vary depending on surface texture and porosity.

### SHELF LIFE

1 year when properly stored

### VOC CONTENT

0 g/L less water and exempt solvents

### DESCRIPTION

MasterSeal 581 is a Portland cement-based coating for concrete and masonry that resists both air infiltration and positive as well as and negative hydrostatic pressure. Polymer-modified with MasterEmaco A 660, MasterSeal 581 creates a low maintenance and highly durable waterproof barrier.

### PRODUCT HIGHLIGHTS

- Waterproof to help protect building interiors from dampness and moisture damage
- Air barrier reduces air infiltration
- Resistant to both positive and negative hydrostatic pressure, making MasterSeal 581 suitable for use below grade interior and exterior and in water treatment construction
- Breathable, allowing interior moisture to escape without damaging coating
- Compatible with high-performance coatings, including a wide range of architectural coatings and textured finishes
- Hides minor surface defects and blemishes in architectural concrete
- Available in ten landscape colors and custom colors (with minimum order quantities)
- Certified to the NSF/ANSI Standard 61 for potable water contact
- Bridges and tunnels (non-traffic bearing surface)
- Water cisterns
- Flashing of rough opening concrete or masonry openings
- Refer to Specific Application section for installations such as Stucco, Below grade, water tanks, etc.

### SUBSTRATES

- Cast-in-place and precast concrete
- Block, brick and porous stone

### COLOR

- White and standard gray
- Custom and landscape colors are available for 5,000 lbs (2,268 kg) minimum order.
- One landscape color: pearl gray

### STORAGE

Transport and store in unopened containers and keep in a clean, dry place protected from rain, dew and humidity. Do not stack bags more than two pallets high. If dry onsite storage of bags is unavailable or if project is located in a very wet, humid climate zone, then specify MasterSeal 581 packaged in 50 lb (22.7 kg) metal pails. Store MasterEmaco A 660 in similar conditions. Do not allow MasterEmaco A 660 to freeze.

### APPLICATIONS

- General
  - Vertical and light-pedestrian horizontal surfaces
  - Interior and exterior
  - Above and below grade
  - Alternative to mechanical finishing or rubbing of concrete
  - Waterproofing basement and retaining walls
  - Foundations

## Technical Data

### Composition

MasterSeal 581 contains cement, graded sand, and proprietary additives.

### Test Data

PROPERTY	RESULTS	TEST METHOD
<b>Initial Set</b> , min, at 70 °F (21 °C), 50% rh	10	Lab Method
<b>Final Set</b> , at 70 °F (21 °C), 50% rh	90	Lab Method
<b>Density</b> , (cured), lbs/ft <sup>3</sup> (kg/m <sup>3</sup> )	129 (2,080)	Lab Method
<b>Positive resistance to hydrostatic pressure</b> , hrs, at 200 psi (1.4 MPa), 461 head ft, air cured at 70 °F (21 °C), 50% rh	752 No leakage, no softening	CRD C 48, modified
<b>Negative resistance to hydrostatic pressure</b> , hrs, at 200 psi (1.4 MPa), 461 head ft, air cured at 70 °F (21 °C), 50% rh	664 Limited dampness	CRD C 48, modified
<b>Water absorption</b> , %, boiling water submersion at 24 hours	3.6	ASTM C 67 (Section 7.3)
<b>Compressive strength</b> , psi (MPa) 7 days 28 days	4,200 (29) 6,030 (42)	ASTM C 109
<b>Flexural strength</b> , psi (MPa) 7 days 28 days	360 (2.5) 1,027 (7)	ASTM C 348
<b>Tensile strength</b> , psi (MPa) 7 days 28 days	250 (2) 440 (3)	ASTM C 190
<b>Modulus of elasticity</b> , psi (MPa) 28 days	2.72 x 10 <sup>6</sup> (1.87 x 10 <sup>4</sup> )	ASTM C 469
<b>Artificial weathering</b> , hrs Xenon Arc Carbon Arc	5,000 = No failure 500 = No failure	ASTM G 26 ASTM G 23
<b>Adhesion strength</b> , psi (MPa)	418 (2.9)	Test by tensile bond
<b>Artificial weathering</b> , 500 hours	No cracking, loss of adhesion, checking, or other defect	Atlas Type DMC weatherometer
<b>Freeze/thaw resistance</b> , 200 cycles	No change	ASTM C 666 (Procedure B)
<b>Salt spray resistance</b> , 300 hours	No defect	ASTM B 117
<b>Carbon Dioxide (CO<sub>2</sub>)</b> , in (mm)	⅛ (1.6) Equivalent to ¾" (19 mm) new concrete	Lab Method Diffusion
<b>Permeance</b> , perms (metric permeability)	12 (0.10698) 18 x 10 <sup>3</sup> resistance	ASTM E 96 (water-vapor transmission) Swedish standard SS-02-15-82

**Test Data, continued**

PROPERTY	RESULTS	TEST METHOD
Wind-driven rain, hrs	8 = excellent	Fed. Spec. TT-P-0035 (Para 4.4.7)
Coefficient of thermal expansion, in/in/°F (mm/mm/°C), at 28 days	$6.99 \times 10^{-6}$ ( $5 \times 10^{-7}$ )	ASTM C 531
Impact strength (Gardener impact tester)	No chipping	Fed. Spec. TT-P-0035 (Cement paints para. 3.4.8)
Hardness, (Barber Coleman Impressor) Requirement min = 30, max = 60		Fed. Spec. TT-P-0035 (para 4.4.9)
7 days	35	
14 days	47	
21 days	52	
Abrasion resistance, 3,000 L sand	Passed	Fed. Spec. TT-P-141B
Standard Reflectance		ASTM D 2244 using Hunterlab D-25 meter
Gray MasterSeal 581	64.2	
White MasterSeal 581	88.1	
Fungus resistance, at 21 days	No growth; meets all requirements	Fed. Spec. TT-P-29B
Surface burning characteristics		ASTM E 84
Flame Spread	0	
Smoke developed	5	
Fire Propagation	Index = 1.5	BS476: Part 6:1981
Flame spread	Class 1	BS476: Part 7:1971
Flame spread		BS476: Part 7:1971
Water Penetration		ASTM E 514
Adhesion		ASTM C 297
Masterseal 581/CMU		
Masterseal 581/concrete		
Stuccobase /Masterseal 581		
ASTM C 926 Stucco/Masterseal 581		
Shear bond		ANSI 118.4 or similar
StuccoBase/Masterseal 581/CMU		
StuccoBase/Masterseal 581/concrete		

Test results are averages obtained under laboratory conditions. Reasonable variations can be expected.

## HOW TO APPLY

### SURFACE PREPARATION

1. Surface preparation is extremely important for proper adhesion. Substrates must be sound and free of dust, dirt, laitance, paints, oils, grease, curing compounds or any other contaminants. Verify substrate has properly cured. Concrete should obtain 80% of design strength, typically achieved within 3–14 days. If efflorescence is present, mechanically remove it before proceeding. For extreme cases where this is not adequate, contact Technical Service.
2. Patch all holes and non-moving cracks before installation with appropriate Master Builders Solutions product.
3. Relieve hydrostatic pressure in concrete block with weep holes.
4. Roughen or brush blast extremely smooth surfaces such as precast and cast-in-place concrete to ensure good mechanical adhesion of MasterSeal 581.
5. Completely saturate the substrate with water and allow surface to dry before application starts. A damp surface will prevent surface drag on the material, keep the substrate cool and eliminate flash drying.

### MIXING

1. Mix MasterSeal 581 with a mixing liquid consisting of a blend of MasterEmaco A 660 diluted with water. Maximum dilution ratio is one part MasterEmaco A 660 (1½ quarts) to three parts water (4½ quarts). Approximately 6 quarts of mixing liquid is needed per 50 lbs of MasterSeal 581 powder. Up to 2 additional quarts of mixing liquid may be added when using as a rubbing compound.
2. For best results, mechanically mix MasterSeal 581 with a slow-speed drill and mixing paddle. Gradually add the powder to the mixing liquid while drill is running.
3. When properly blended, MasterSeal 581 will have the lump-free consistency of smooth, heavy batter.
4. Allow the MasterSeal 581 and MasterEmaco A 660 mixture to rest undisturbed for a minimum of 10 minutes to fully wet out all the powder. Then mix the wet mixture and apply. A small amount of mixing liquid can be added to the mixture.
5. Pot life is 60–90 minutes at 70 °F (21 °C). At high temperatures and low relative humidity, pot life can be significantly less.

## APPLICATION

1. Apply MasterSeal 581 with a tampico brush or broom or equivalent stiff fiber brush or by textured spray equipment. Spray applications of the first coat require back brushing or brooming to properly fill voids and achieve uniformity and optimum adhesion.
2. It is essential to work first coat thoroughly into the substrate to completely fill and cover all voids, holes and nonmoving cracks. Finish with a horizontal stroke for an even coat.
3. Allow to cure 24 hours, then apply the second coat and finish with a vertical stroke. Above grade, the second coat can be replaced with a MasterProtect high-build architectural coating to achieve better color uniformity.
4. On block or masonry walls, allow 5–7 days before applying second coat to eliminate joint read through or shadowing.

### SPECIFIC APPLICATIONS

Above-grade interior or exterior applications in positive pressure situations (direct contact with rain or standing water with a low head of pressure)

1. A 50 lb (22.7 kg) bag of MasterSeal 581 will provide the following coverage at the designated material usage.  
RECOMMENDED COVERAGE:
  - First Coat: 2 lbs/yd<sup>2</sup> (1.1 kg/m<sup>2</sup>) = 225 ft<sup>2</sup>/50 lb bag (20.9 m<sup>2</sup>/22.7 kg bag)
  - Second Coat: 1 lb/yd<sup>2</sup> (0.54 kg/m<sup>2</sup>) = 450 ft<sup>2</sup>/50 lb bag (41.8 m<sup>2</sup>/22.7 kg bag)
  - Total: 3 lbs/yd<sup>2</sup> (1.6 kg/m<sup>2</sup>), cured nominal thickness of ⅛" (1.6 mm).  
Coverage will vary depending on surface texture and porosity.
2. A 3 lbs/yd<sup>2</sup> (1.6 kg/m<sup>2</sup>) application rate does not eliminate surface irregularities such as struck mortar joints. To hide surface irregularities, spray and back-brush a base coat of MasterSeal 581 at 2 lbs/yd<sup>2</sup> (1.1 kg/m<sup>2</sup>) and allow it to cure for 5–7 days. If additional leveling is required use MasterSeal 581 Plaster Mix.

### BELOW-GRADE INTERIOR APPLICATIONS

1. The standard application is 3 lbs/yd<sup>2</sup> (1.6 kg/m<sup>2</sup>).
2. For high hydrostatic pressure conditions (over 15 psi [0.10 MPa]), increase application rate to 4 lbs/yd<sup>2</sup> (2.2 kg/m<sup>2</sup>) and waterproof from the positive side wherever possible.

### BELOW-GRADE EXTERIOR APPLICATIONS

1. Use MasterSeal 582 (see Form No. 1019907) For high hydrostatic pressure conditions (over 15 psi [0.10 MPa]), apply a base coat of MasterSeal 582 at 2 lbs/yd<sup>2</sup> (1.1 kg/m<sup>2</sup>) and allow to cure for 5–7 days.
2. Then apply MasterSeal 581 at 2 lbs/yd<sup>2</sup> (1.1 kg/m<sup>2</sup>). If additional leveling is required use MasterSeal 581 Plaster Mix. A steel trowel finish is recommended.
3. For both below-grade interior and below-grade exterior applications where water might move between vertical walls and slab or footer, it is recommended to cut out and place a MasterSeal 590 cove at the wall and floor junction prior to the application of the MasterSeal 581 base coat.
4. MasterSeal 581 can be covered with extruded polystyrene insulation board during the second coat application. The board must be fully coated with MasterSeal 581 and embedded into the still-wet coating already in place on the walls. Use care when placing the coated board because it should not be moved or slipped. Once placed, do not move the board. After curing, prepare the above-grade portions of the boards by roughening or removing the surface skin and then coating with MasterSeal 581 to protect them from UV light degradation.

### WATERPROOFING POTABLE WATER TANKS OR RESERVOIRS

1. Install MasterSeal 581 as directed in the general Application instructions.
2. After MasterSeal 581 has fully cured, wash down the MasterSeal 581 surface with saline solution (salt brine, 1 lb salt per 1 gallon water).
3. Leave saline solution on the entire MasterSeal 581 surface for at least 24 hours.
4. Rinse off saline solution completely. If needed, reapply saline solution until final rinse water is completely clean and clear.

## APPLICATION

1. MasterSeal 581 shall be applied to CMU or concrete substrates in accordance with and prepared per MasterSeal 581 Technical Guide.
  2. Mix MasterSeal 581 with a mixing liquid consisting of a blend of MasterEmaco A 660 diluted with water. Dilution ratio is one part MasterEmaco A 660 to three parts water.
  3. Apply MasterSeal 581 at standard recommended thicknesses with a stiff fiber brush using a two coat application. Allow the first coat to cure 24 hours and then apply a second coat perpendicular to the first coat.
  4. Allow MasterSeal 581 to cure and then directly apply Master Builders Solutions Stuccobase per manufacturers specifications (need link to website or websites) or Portland Cement Plaster (Stucco) per ASTM C 926. Nominal thickness shall be 5/8".
- Windy, dry or hot conditions may require rewetting of MasterSeal 581 during cure and the use of polyethylene barriers.
  - Before specifying MasterSeal 581 for water retaining structures, conduct tests to determine water quality. MasterSeal 581 is not intended for continuous contact with acid or sulfate-containing water. Very soft water will have an adverse effect on MasterSeal 581.
  - Service temperatures: immersion, up to 140 °F (60 °C); cleaning water, up to 200 °F (93 °C); dry air, up to 220 °F (104 °C).
  - On all projects, it is recommended that a sample be prepared on site and approved prior to the commencement of the work. The site sample should confirm the color, texture and workmanship required until the job is finished and accepted. Retain the sample until final approval is secured.
  - Allow MasterSeal 581 to cure 7–10 days before immersion in water.
  - Proper application is the responsibility of the user. Field visits by Master Builders Solutions personnel are for the purpose of making technical recommendations only and not for supervising or providing quality control on the jobsite.

## CLEAN UP

Promptly clean hands and all tools with warm water while product is still wet. Cured material may only be removed mechanically.

## FOR BEST PERFORMANCE

- MasterSeal 581 must be modified with MasterEmaco A 660 to achieve the properties listed in the technical data section.
- Do not apply to substrates with active water leaks or moving cracks; patch all leaking static cracks and holes with MasterSeal 590. Repair any other nonmoving cracks or voids with the appropriate MasterEmaco repair product and repair all moving cracks or voids with appropriate sealant.
- Do not apply in rain or when rain is expected within 24 hours. Do not apply above 90 °F (32 °C) or below 40 °F (4 °C) or when temperatures are expected to fall below 40 °F (4 °C) within 24 hours. For hot and cold temperature applications, store MasterSeal 581, MasterEmaco A 660 and water at 50 °F (10 °C) to 70 °F (21 °C) before use.
- Hot substrates will affect working time and material strength.
- Variations between inside and outside temperatures may result in condensation on below-grade walls treated with MasterSeal 581. This can be alleviated by assuring that adequate ventilation exists.

## HEALTH, SAFETY AND ENVIRONMENTAL

Read, understand and follow all Safety Data Sheets and product label information for this product prior to use. The SDS can be obtained by visiting [www.master-builders-solutions.com/en-us](http://www.master-builders-solutions.com/en-us), e-mailing your request to [mbsbscst@mbcc-group.com](mailto:mbsbscst@mbcc-group.com) or calling 1(800)433-9517. Use only as directed.

**IN CASE OF EMERGENCY: Call CHEMTEL +1 (800) 255-3924 or if outside the US or Canada, +1 (813) 248-0585.**

## LIMITED WARRANTY NOTICE

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